



Approval body for construction products and types of construction

#### **Bautechnisches Prüfamt**

An institution established by the Federal and Laender Governments



# European Technical Assessment

# ETA-09/0340 of 20 October 2014

#### **General Part**

Technical Assessment Body issuing the European Technical Assessment:

Trade name of the construction product

Product family to which the construction product belongs

Manufacturer

Manufacturing plant

This European Technical Assessment contains

This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of

Deutsches Institut für Bautechnik

Mungo Injection system MIT 600 RE for concrete

Bonded anchor with anchor rod for use in concrete

Mungo Befestigungstechnik AG Bornfeldstrasse 2 4603 OLTEN SCHWEIZ

Mungo 2

27 pages including 3 annexes which form an integral part of this assessment

Guideline for European technical approval of "Metal anchors for use in concrete", ETAG 001 Part 5: "Bonded anchors", April 2013, used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011.

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# European Technical Assessment ETA-09/0340

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#### Specific Part

#### 1 Technical description of the product

The "Mungo Injection System MIT 600 RE for concrete" is a bonded anchor consisting of a cartridge with injection mortar MIT 600 RE and a steel element. The steel element consist of a commercial threaded rod with washer and hexagon nut in the range of M8 to M30 or a reinforcing bar in the range of diameter 8 to 32 mm.

The steel element is placed into a drilled hole filled with injection mortar and is anchored via the bond between metal part, injection mortar and concrete.

The product description is given in Annex A.

# 2 Specification of the intended use in accordance with the applicable European Assessment Document

The performances given in Section 3 are only valid if the anchor is used in compliance with the specifications and conditions given in Annex B.

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the anchor of at least 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

#### 3 Performance of the product and references to the methods used for its assessment

#### 3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Characteristic resistance for design according to TR 029 and TR 045	See Annex C 1 to C6
Characteristic resistance for design according to CEN/TS 1992-4:2009 and TR 045	See Annex C 7 to C 12
Displacements under tension and shear loads	See Annex C 13 / C 14

#### 3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Anchorages satisfy requirements for Class A1
Resistance to fire	No performance determined (NPD)

### 3.3 Hygiene, health and the environment (BWR 3)

Regarding dangerous substances there may be requirements (e.g. transposed European legislation and national laws, regulations and administrative provisions) applicable to the products falling within the scope of this European Technical Assessment. In order to meet the provisions of Regulation (EU) No 305/2011, these requirements need also to be complied with, when and where they apply.



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#### 3.4 Safety in use (BWR 4)

The essential characteristics regarding Safety in use are included under the Basic Works Requirement Mechanical resistance and stability.

- 3.5 Protection against noise (BWR 5) Not applicable.
- 3.6 Energy economy and heat retention (BWR 6) Not applicable.

#### 3.7 Sustainable use of natural resources (BWR 7)

The sustainable use of natural resources was not investigated.

#### 3.8 General aspects

The verification of durability is part of testing the essential characteristics. Durability is only ensured if the specifications of intended use according to Annex B are taken into account.

# 4 Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base

According to Decision of the Commission of 24 June 1996 (96/582/EC) (OJ L 254 of 08.10.96 p. 62-65), the system of assessment and verification of constancy of performance (see Annex V and Article 65 Paragraph 2 to Regulation (EU) No 305/2011) given in the following table applies.

Product	Intended use	Level or class	System
Metal anchors for use in concrete (heavy-duty type)	For fixing and/or supporting concrete structural elements or heavy units such as cladding and suspended ceilings	_	1

# Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at Deutsches Institut für Bautechnik.

Issued in Berlin on 20 October 2014 by Deutsches Institut für Bautechnik

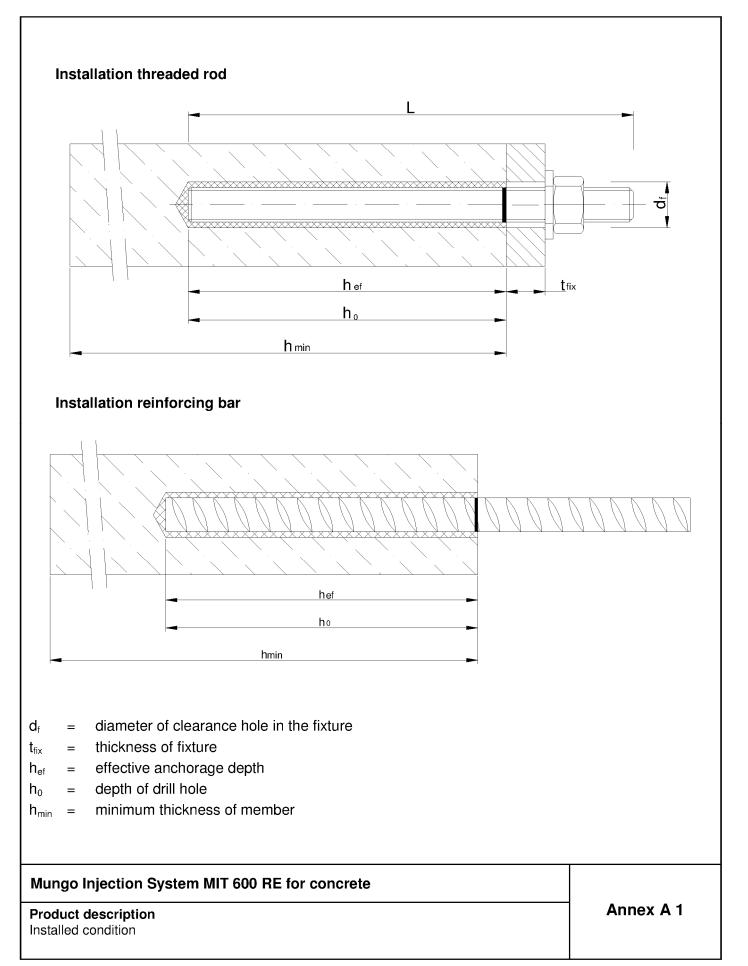
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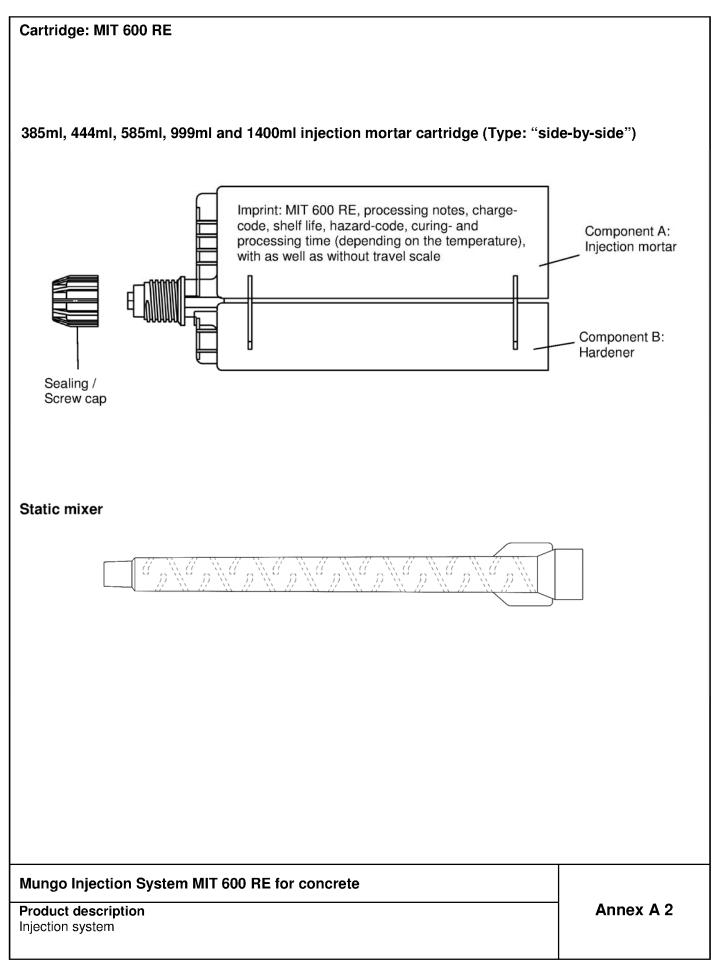
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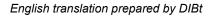
English translation prepared by DIBt



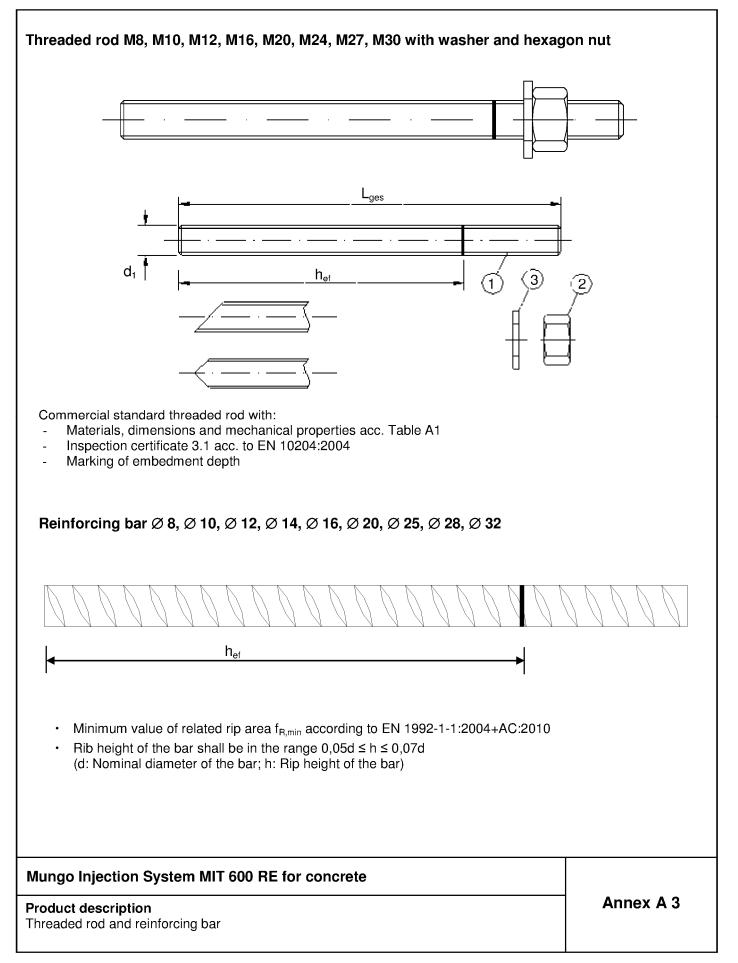














# Table A1: Materials

Part	Designation	Material	
Steel,	, zinc plated $\ge 5 \ \mu m$ acc. to EN ISO 4042:19 , hot-dip galvanised $\ge 40 \ \mu m$ acc. to EN ISO	999 or	2.2000
1	Anchor rod	Steel, EN 10087:1998 or EN 10263:200	)1
2	Hexagon nut, EN ISO 4032:2012	Property class 4.6, 5.8, 8.8, EN 1993-1-8 Steel acc. to EN 10087:1998 or EN 102 Property class 4 (for class 4.6 rod) EN IS Property class 5 (for class 5.8 rod) EN IS Property class 8 (for class 8.8 rod) EN IS	63:2001 SO 898-2:2012, SO 898-2:2012,
3	Washer, EN ISO 887:2006, EN ISO 7089:2000, EN ISO 7093:2000 or EN ISO 7094:2000	Steel, zinc plated or hot-dip galvanised	
Stain	less steel		
1	Anchor rod	Material 1.4401 / 1.4404 / 1.4571, EN 10 > M24: Property class 50 EN ISO 3506- ≤ M24: Property class 70 EN ISO 3506-	1:2009
2	Hexagon nut, EN ISO 4032:2012	Material 1.4401 / 1.4404 / 1.4571 EN 10 > M24: Property class 50 (for class 50 rc ≤ M24: Property class 70 (for class 70 rc	od) EN ISO 3506-2:2009
3	Washer, EN ISO 887:2006, EN ISO 7089:2000, EN ISO 7093:2000 or EN ISO 7094:2000	Material 1.4401, 1.4404 or 1.4571, EN	0088-1:2005
High	corrosion resistance steel		
1	Anchor rod	Material 1.4529 / 1.4565, EN 10088-1:20 > M24: Property class 50 EN ISO 3506- ≤ M24: Property class 70 EN ISO 3506-	1:2009
2	Hexagon nut, EN ISO 4032:2012	Material 1.4529 / 1.4565 EN 10088-1:20 > M24: Property class 50 (for class 50 rc ≤ M24: Property class 70 (for class 70 rc	05, od) EN ISO 3506-2:2009
3	Washer, EN ISO 887:2006, EN ISO 7089:2000, EN ISO 7093:2000 or EN ISO 7094:2000	Material 1.4529 / 1.4565, EN 10088-1:20	
Reinf	orcing bars		
1	Rebar EN 1992-1-1:2004+AC:2010, Annex C	Bars and de-coiled rods class B or C $f_{yk}$ and k according to NDP or NCL of EN $f_{uk} = f_{tk} = k \cdot f_{yk}$	l 1992-1-1/NA:2013
	ngo Injection System MIT 600 RE for co	oncrete	Annex A 4
Mate			



# Specifications of intended use

#### Anchorages subject to:

- Static and quasi-static loads: M8 to M30, Rebar Ø8 to Ø32.
- Seismic action for Performance Category C1: M12 to M30, Rebar Ø12 to Ø32.
- Seismic action for Performance Category C2: M12 and M16.

#### **Base materials:**

- Reinforced or unreinforced normal weight concrete according to EN 206-1:2000.
- Strength classes C20/25 to C50/60 according to EN 206-1:2000.
- Non-cracked concrete: M8 to M30, Rebar Ø8 to Ø32.
- Cracked concrete: M12 to M30, Rebar Ø12 to Ø32.

#### **Temperature Range:**

- I: 40 °C to +40 °C (max long term temperature +24 °C and max short term temperature +40 °C)
- II: 40 °C to +60 °C (max long term temperature +43 °C and max short term temperature +60 °C)
- III: 40 °C to +72 °C (max long term temperature +43 °C and max short term temperature +72 °C)

### Use conditions (Environmental conditions):

- Structures subject to dry internal conditions (zinc coated steel, stainless steel or high corrosion resistant steel).
- Structures subject to external atmospheric exposure (including industrial and marine environment) and to permanently damp internal condition, if no particular aggressive conditions exist (stainless steel or high corrosion resistant steel).
- Structures subject to external atmospheric exposure and to permanently damp internal condition, if other particular aggressive conditions exist (high corrosion resistant steel).

Note: Particular aggressive conditions are e.g. permanent, alternating immersion in seawater or the splash zone of seawater, chloride atmosphere of indoor swimming pools or atmosphere with extreme chemical pollution (e.g. in desulphurization plants or road tunnels where de-icing materials are used).

#### Design:

- Verifiable calculation notes and drawings are prepared taking account of the loads to be anchored. The position of the anchor is indicated on the design drawings (e. g. position of the anchor relative to reinforcement or to supports, etc.).
- Anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete work.
- Anchorages under static or quasi-static actions are designed in accordance with:
  - EOTA Technical Report TR 029 "Design of bonded anchors", Edition September 2010 or
  - CEN/TS 1992-4:2009
- Anchorages under seismic actions (cracked concrete) are designed in accordance with:
  - EOTA Technical Report TR 045 "Design of Metal Anchors under Seismic Action", Edition February 2013
  - Anchorages shall be positioned outside of critical regions (e.g. plastic hinges) of the concrete structure.
  - Fastenings in stand-off installation or with a grout layer are not allowed.

#### Installation:

- Dry or wet concrete: M8 to M30, Rebar Ø8 to Ø32.
- Flooded holes (not sea water): M8 to M30, Rebar Ø8 to Ø32.
- Hole drilling by hammer or compressed air drill mode.
- Overhead installation allowed.
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.

### Mungo Injection System MIT 600 RE for concrete

#### Intended Use

Specifications

Annex B 1



Anchor size		M 8	M 10	M 12	M 16	M 20	M 24	M 27	M 30
Nominal drill hole diameter	d <sub>0</sub> [mm] =	10	12	14	18	24	28	32	35
	h <sub>ef,min</sub> [mm] =	60	60	70	80	90	96	108	120
Effective anchorage depth	h <sub>ef,max</sub> [mm] =	96	120	144	192	240	288	324	360
Diameter of clearance hole in the fixture	d <sub>f</sub> [mm] ≤	9	9 12 14 18 22 26 30					33	
Diameter of steel brush	d <sub>b</sub> [mm] ≥	12 14 16 20 26 30 34					37		
Torque moment	T <sub>inst</sub> [Nm] ≤	10	20	40	80	120	160	180	200
Thiskness of fixture	t <sub>fix,min</sub> [mm] >	0							
Thickness of fixture	t <sub>fix,max</sub> [mm] <				15	00			
Minimum thickness of member	h <sub>min</sub> [mm]	] h <sub>ef</sub> + 30 mm ≥ 100 mm h <sub>ef</sub> + 2d <sub>0</sub>							
Minimum spacing	s <sub>min</sub> [mm]	40	50	60	80	100	120	135	150
Minimum edge distance	c <sub>min</sub> [mm]	40	50	60	80	100	120	135	150

# Table B2: Installation parameters for rebar

Rebar size		Ø 8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
Nominal drill hole diameter	d <sub>0</sub> [mm] =	12	14	16	18	20	24	32	35	40
Effective encharage depth	h <sub>ef,min</sub> [mm] =	60	60	70	75	80	90	100	112	128
Effective anchorage depth	h <sub>ef,max</sub> [mm] =	96	120	144	168	192	240	300	336	384
Diameter of steel brush	d <sub>b</sub> [mm] ≥	14	16	18	20	22	26	34	37	41,5
Minimum thickness of member	h <sub>min</sub> [mm]		30 mm 0 mm				h <sub>ef</sub> + 2d <sub>0</sub>	)		
Minimum spacing	s <sub>min</sub> [mm]	40	50	60	70	80	100	125	140	160
Minimum edge distance	c <sub>min</sub> [mm]	40	50	60	70	80	100	125	140	160

# Mungo Injection System MIT 600 RE for concrete

Intended Use Installation parameters Annex B 2



#### Steel brush Table B3: Parameter cleaning and setting tools d<sub>b,min</sub> Piston Threaded d<sub>0</sub> $d_{b}$ Rebar min. Rod Drill bit - Ø Brush - Ø plug Brush - Ø (mm) (mm) (mm)(mm) (mm)(No.) M8 10 12 10.5 M10 8 12 14 12,5 No M12 10 14 16 14,5 piston plug 12 16 18 16,5 required M16 14 18 20 18,5 16 20 22 20,5 24 26 M20 20 24,5 # 24 M24 28 30 28,5 # 28 M27 25 32 34 32,5 # 32

37

41,5

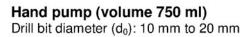
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40



28

32







35,5

40,5

Recommended compressed air tool (min 6 bar) Drill bit diameter ( $d_0$ ): 10 mm to 40 mm

### **Piston plug for overhead or horizontal installation** Drill bit diameter (d<sub>0</sub>): 24 mm to 40 mm

# Mungo Injection System MIT 600 RE for concrete

### Intended Use

M30

Cleaning and setting tools

Annex B 3

# 35

# 38



Installation inst	ructions	
	1. Drill with hammer drill a hole into the base material to the size a depth required by the selected anchor (Table B1 or Table B2). I drill hole: the drill hole shall be filled with mortar	
	Attention! Standing water in the bore hole must be removed	d before cleaning.
2x	2a. Starting from the bottom or back of the bore hole, blow the hole compressed air (min. 6 bar) or a hand pump (Annex B 3) a mini the bore hole ground is not reached an extension shall be used.	mum of two times. If
or	The hand-pump can be used for anchor sizes up to bore hole di	ameter 20 mm.
2x	For bore holes larger than 20 mm or deeper 240 mm, compress <b>must</b> be used.	ed air (min. 6 bar)
	2b. Check brush diameter (Table B3) and attach the brush to a drilli or a battery screwdriver. Brush the hole with an appropriate size > d <sub>b,min</sub> (Table B3) a minimum of two times.	ed wire brush
2x	If the bore hole ground is not reached with the brush, a brush ex shall be used (Table B3).	tension
	2c. Finally blow the hole clean again with compressed air (min. 6 ba (Annex B 3) a minimum of two times. If the bore hole ground is extension shall be used.	
2x or	The hand-pump can be used for anchor sizes up to bore hole di For bore holes larger than 20 mm or deeper 240 mm, compress <u>must</u> be used.	
2x	After cleaning, the bore hole has to be protected against re an appropriate way, until dispensing the mortar in the bore the cleaning repeated has to be directly before dispensing In-flowing water must not contaminate the bore hole again.	hole. If necessary, the mortar.
	3. Attach a supplied static-mixing nozzle to the cartridge and load correct dispensing tool. Cut off the foil tube clip before use. For every working interruption longer than the recommended we (Table B4) as well as for new cartridges, a new static-mixer sha	orking time
	4. Prior to inserting the anchor rod into the filled bore hole, the posembedment depth shall be marked on the anchor rods.	ition of the
min. 3 full stroke	5. Prior to dispensing into the anchor hole, squeeze out separately full strokes and discard non-uniformly mixed adhesive componer shows a consistent grey colour. For foil tube cartridges is must b minimum of six full strokes.	nts until the mortar
Mungo Injection S	System MIT 600 RE for concrete	
Intended Use		Annex B 4

Installation instructions



Installation inst	ructions (continuation)
	6. Starting from the bottom or back of the cleaned anchor hole fill the hole up to approximately two-thirds with adhesive. Slowly withdraw the static mixing nozzle as the hole fills to avoid creating air pockets. For embedment larger than 190 mm an extension nozzle shall be used. For overhead and horizontal installation a piston plug (Annex B 3) and extension nozzle shall be used. Observe the gel-/ working times given in Table B4.
	7. Push the threaded rod or reinforcing bar into the anchor hole while turning slightly to ensure positive distribution of the adhesive until the embedment depth is reached. The anchor should be free of dirt, grease, oil or other foreign material.
	<ol> <li>Be sure that the anchor is fully seated at the bottom of the hole and that excess mortar is visible at the top of the hole. If these requirements are not maintained, the application has to be renewed. For overhead application the anchor rod should be fixed (e.g. wedges).</li> </ol>
20°C e.g.	<ul> <li>Allow the adhesive to cure to the specified time prior to applying any load or torque. Do not move or load the anchor until it is fully cured (attend Table B4).</li> </ul>
	<ol> <li>After full curing, the add-on part can be installed with the max. torque (Table B2) by using a calibrated torque wrench.</li> </ol>

# Table B4: Minimum curing time

Concrete temperature	Gelling- working time	Minimum curing time in dry concrete	Minimum curing time in wet concrete
≥ 5 °C	120 min	50 h	100 h
≥ + 10 °C	90 min	30 h	60 h
≥ + 20 °C	30 min	10 h	20 h
≥ + 30 °C	20 min	6 h	12 h
≥ + 40 °C	12 min	4 h	8 h

### Mungo Injection System MIT 600 RE for concrete

Installation instructions (continuation) Curing time Annex B 5



Anchor size threaded ro	d			M 8	M 10	M 12	M 16	M 20	M24	M 27	M 30	
Steel failure												
Characteristic tension resi Steel, property class 4.6	istance,	N <sub>Rk,s</sub>	[kN]	15	23	34	63	98	141	184	224	
Characteristic tension resi Steel, property class 5.8	stance,	N <sub>Rk,s</sub>	[kN]	18	29	42	78	122	176	230	280	
Characteristic tension resi Steel, property class 8.8	istance,	N <sub>Rk,s</sub>	[kN]	29	46	67	125	196	282	368	449	
Characteristic tension resi Stainless steel A4 and HC property class 50 (>M24) a	R,	N <sub>Rk,s</sub>	[kN]	26	41	59	110	171	247	230	281	
Combined pull-out and o	concrete cone failure											
Characteristic bond resista	ance in non-cracked con	crete C20/	25									
Temperature range I:	dry and wet concrete	$\tau_{Rk,ucr}$	[N/mm <sup>2</sup> ]	15	15	15	14	13	12	12	12	
40°C/24°C	flooded bore hole	$\tau_{Rk,uor}$	[N/mm <sup>2</sup> ]	15	14	13	10	9,5	8,5	7,5	7,0	
Temperature range II: 60°C/43°C	dry and wet concrete	$\tau_{Rk,ucr}$	[N/mm <sup>2</sup> ]	9,5	9,5	9,0	8,5	8,0	7,5	7,5	7,5	
	flooded bore hole	τ <sub>Rk,ucr</sub>	[N/mm <sup>2</sup> ]	9,5	9,5	9,0	8,5	7,5	7,0	6,5	6,0	
Temperature range III:	dry and wet concrete	$\tau_{Rk,ucr}$	[N/mm²]	8,5	8,5	8,0	7,5	7,0	7,0	6,5	6,5	
72°C/43°C	flooded bore hole	$\tau_{Rk,ucr}$	[N/mm²]	8,5	8,5	8,0	7,5	7,0	6,0	5,5	5,5	
		C30/37		1,04								
Increasing factors for conc $\Psi_c$	crete	C40/50		1,08								
		C50/60		1,10								
Splitting failure												
Edge distance		C <sub>cr,sp</sub>	[mm]		1,0	) · h <sub>ef</sub> ≤	2 · h <sub>ef</sub> 2	$5 - \frac{h}{h_{ef}}$	) ≤ 2,4 ·	h <sub>ef</sub>		
Axial distance		S <sub>cr,sp</sub>	[mm]					cr,sp				
Install safety factor (dry ar	nd wet concrete)	γ2		1,2 1,4								
Install safety factor (floode	ed bore hole)	γ <sub>2</sub>					1	,4				
		1										

### Mungo Injection System MIT 600 RE for concrete

Performances

Characteristic values of resistance for threaded rods under tension loads in non-cracked concrete (Design according to TR 029)

Annex C 1

Electronic copy of the ETA by DIBt: ETA-09/0340



Anchor size threaded	rod			M 12	M 16	M 20	M24	M 27	M 30
Steel failure									
Characteristic tension re Steel, property class 4.6	,	N <sub>Rk,s</sub> =N <sup>0</sup> <sub>Rk,s,seis</sub>	[kN]	34	63	98	141	184	224
Characteristic tension re Steel, property class 5.8	esistance,	N <sub>Rk,s</sub> =N <sup>0</sup> <sub>Rk,s,seis</sub>	[kN]	42	78	122	176	230	280
Characteristic tension re	esistance,	N <sub>Rk.s</sub> =N <sup>0</sup> <sub>Rk.s.seis</sub>	[kN]	67	125	196	282	368	449
Steel, property class 8.8 Characteristic tension resistance, Stainless steel A4 and HCR,		N <sub>Rk,s</sub> =N <sup>0</sup> <sub>Rk,s,seis</sub>	[kN]	59	110	171	247	230	281
property class 50 (>M24 Combined pull-out and	d concrete cone failure								
	stance in cracked concret	o C20/25							
			[N]/mm2]	7.5	C F	6.0	EE	E E	
		τ <sub>Rk,cr</sub>	[N/mm <sup>2</sup> ]	7,5	6,5	6,0	5,5	5,5	5,5
	dry and wet concrete	τ <sup>0</sup> <sub>Rk,seis,C1</sub>	[N/mm <sup>2</sup> ]	7,1	6,2	5,7	5,5	5,5	5,5
Temperature range I:		$\tau^0_{Rk,seis,C2}$	[N/mm <sup>2</sup> ]	2,4	2,2			Determined	· · ·
40°C/24°C		τ <sub>Rk,cr</sub>	[N/mm <sup>2</sup> ]	7,5	6,0	5,0	4,5	4,0	4,0
	flooded bore hole	$\tau^0_{Rk,seis,C1}$	[N/mm <sup>2</sup> ]	7,1	5,8	4,8	4,5	4,0	4,0
		$\tau^0_{Rk,seis,C2}$	[N/mm <sup>2</sup> ]	2,4	2,1	No Pe	rformance	Determined	(NPD)
		$\tau_{\rm Rk,cr}$	[N/mm <sup>2</sup> ]	4,5	4,0	3,5	3,5	3,5	3,5
	dry and wet concrete	$\tau^0_{Rk.seis.C1}$	[N/mm <sup>2</sup> ]	4,3	3,8	3,4	3,5	3,5	3,5
Temperature range II:		$\tau^0_{Rk,seis,C2}$	[N/mm <sup>2</sup> ]	1,4	1,4	No Pe	rformance	_ Determined	(NPD)
60°C/43°C		τ <sub>Rk,cr</sub>	[N/mm <sup>2</sup> ]	4,5	4.0	3,5	3,5	3,5	3,5
	flooded bore hole	τ <sup>0</sup> <sub>Rk,seis,C1</sub>	[N/mm <sup>2</sup> ]	4,3	3,8	3,4	3,5	3,5	3.5
			[N/mm <sup>2</sup> ]	1,4	1,4		,	Determined	- , -
		τ <sup>0</sup> <sub>Rk,seis,C2</sub>			,				· ·
		τ <sub>Rk,cr</sub>	[N/mm <sup>2</sup> ]	4,0	3,5	3,0	3,0	3,0	3,0
	dry and wet concrete	$\tau^0_{Rk,seis,C1}$	[N/mm <sup>2</sup> ]	3,9	3,4	3,0	3,0	3,0	3,0
Temperature range III:		τ <sup>0</sup> <sub>Rk,seis,C2</sub>	[N/mm <sup>2</sup> ]	1,3	1,2		rformance	Determined	(NPD)
72°C/43°C		$\tau_{Rk,cr}$	[N/mm <sup>2</sup> ]	4,0	3,5	3,0	3,0	3,0	3,0
	flooded bore hole	$\tau^0_{Rk,seis,C1}$	[N/mm <sup>2</sup> ]	3,9	3,4	3,0	3,0	3,0	3,0
		$\tau^0_{Rk,seis,C2}$	[N/mm <sup>2</sup> ]	1,3	1,2	No Pe	rformance	Determined	(NPD)
Increasing factors for as	noroto	C30/37				1,	04		
Increasing factors for co (only static or quasi-stat		C40/50		1.08					
Ψc	,	C50/60		1,10					
Splitting failure		000/00				1,	10		
Edge distance		C <sub>cr,sp</sub>	[mm]		1,0 ⋅ h <sub>ef</sub> ≤	≤2·h <sub>ef</sub> (2	,5 - <u>h</u> ):	≤ 2,4 · h <sub>ef</sub>	
Axial distance		S <sub>cr,sp</sub>	[mm]			2 c			
Installation safety factor	(dry and wet concrete)	γ2	1	1	,2			,4	
Installation safety factor		γ2				1	,4		
		<sup>12</sup>					, <b>.</b>		
							-		

Characteristic values of resistance for threaded rods under tension loads in cracked concrete (Design according to TR 029 or TR 045)



Anchor size threaded rod			M 8	M 10	M 12	M 16	M 20	M24	M 27	M 30
Steel failure without lever arm			•							
	V <sub>Rk,s</sub>	[kN]	7	12	17	31	49	71	92	112
Characteristic shear resistance, Steel, property class 4.6	V <sup>0</sup> <sub>Rk,s,seis,C1</sub>	[kN]		ormance	14	27	42	56	72	88
	V <sup>0</sup> <sub>Rk,s,seis,C2</sub>	[kN]		mined PD)	13	25	No Perf	ormance l	Determine	d (NPD
	V <sub>Rk,s</sub>	[kN]	9	15	21	39	61	88	115	140
Characteristic shear resistance, Steel, property class 5.8	V <sup>0</sup> <sub>Rk,s,seis,C1</sub>	[kN]		ormance	18	34	53	70	91	111
	V <sup>0</sup> <sub>Rk,s,seis,C2</sub>	[kN]		mined PD)	17	31	No Perf	ormance I	Determine	d (NPD
	V <sub>Rk,s</sub>	[kN]	15	23	34	63	98	141	184	224
Characteristic shear resistance, Steel, property class 8.8	V <sup>0</sup> Rk,s,seis,C1	[kN]		ormance	30	55	85	111	145	177
	V <sup>0</sup> <sub>Rk,s,seis,C2</sub>	[kN]		mined PD)	27	50	No Perf	ormance l	Determine	d (NPD
Characteristic shear resistance.	V <sub>Rk,s</sub>	[kN]	13	20	30	55	86	124	115	140
Stainless steel A4 and HCR,	V <sup>0</sup> Rk,s,seis,C1	[kN]		ormance mined	26	48	75	98	91	111
property class 50 (>M24) and 70 ( $\leq$ M24)	V <sup>0</sup> Rk,s,seis,C2	[kN]		PD)	24	44	No Perf	ormance l	Determine	ed (NPD
Steel failure with lever arm						-				
	M <sup>0</sup> <sub>Rk.s</sub>	[Nm]	15	30	52	133	260	449	666	900
Characteristic bending moment, Steel, property class 4.6	M <sup>0</sup> <sub>Rk,s,seis,C1</sub>	[Nm]		1		·	· · ·		1	1
	M <sup>0</sup> <sub>Rk,s,seis,C2</sub>	[Nm]			No Perf	ormance I	Determine	a (NPD)		
haracteristic bending moment	M <sup>0</sup> <sub>Rk,s</sub>	[Nm]	19	37	65	166	324	560	833	1123
haracteristic bending moment, teel, property class 5.8	M <sup>0</sup> <sub>Rk,s,seis,C1</sub>	[Nm]	No Performance Determined (NPD)							
	M <sup>0</sup> <sub>Rk,s,seis,C2</sub>	[Nm]	No Performance Determined (NPD)							
	M <sup>0</sup> <sub>Rk,s</sub>	[Nm]	30	60	105	266	519	896	1333	1797
Characteristic bending moment, Steel, property class 8.8	M <sup>0</sup> <sub>Rk,s,seis,C1</sub>	[Nm]	_		No Porf	ormance l	Determine	d (NPD)		
	M <sup>0</sup> <sub>Rk,s,seis,C2</sub>	[Nm]								
Characteristic bending moment,	M <sup>0</sup> <sub>Rk,s</sub>	[Nm]	26	52	92	232	454	784	832	1125
Stainless steel A4 and HCR, property class 50 (>M24) and 70 ( $\leq$ M24)	$M^0_{Rk,s,seis,C1}$	[Nm]			No Perf	ormance l	Determine	d (NPD)		
	$M^0_{\rm Rk,s,seis,C2}$	[Nm]						u ()		
Concrete pry-out failure										
Factor k in equation (5.7) of Technical Report TR 029 for the design of Bonded Anchors	k	[-]				2	,0			
Installation safety factor	γ2					1	,0			
Concrete edge failure			1							
Installation safety factor	γ2					1	,0			
			<u> </u>							

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concrete, (Design according to TR 029 or TR 045)



	aracteristic va n-cracked cou								on loa	ds in		
Anchor size reinforcing	bar			Ø 8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
Steel failure												
Characteristic tension resis	stance	N <sub>Rk,s</sub>	[kN]					$A_{s} \boldsymbol{\cdot} f_{uk}$				
Combined pull-out and c	oncrete cone failur	е										
Characteristic bond resista	ance in uncracked co	ncrete C20	/25									
Temperature range I:	dry and wet concrete	$ au_{Rk,ucr}$	[N/mm <sup>2</sup> ]	14	14	13	13	12	12	11	11	11
40°C/24°C	flooded bore hole	$ au_{\mathrm{Rk,ucr}}$	[N/mm²]	14	13	11	10	9,5	8,5	7,5	7,0	6,0
Temperature range II:	dry and wet concrete	$\tau_{\rm Rk,ucr}$	[N/mm <sup>2</sup> ]	8,5	8,5	8,0	8,0	7,5	7,0	7,0	6,5	6,5
60°C/43°C	flooded bore hole	τ <sub>Rk,ucr</sub>	[N/mm²]	8,5	8,5	8,0	8,0	7,5	7,0	6,0	5,5	5,0
Temperature range III:	dry and wet concrete	$ au_{\mathrm{Rk},\mathrm{ucr}}$	[N/mm²]	7,5	7,5	7,5	7,0	7,0	6,5	6,0	6,0	6,0
72°C/43°C	flooded bore hole	$\tau_{\rm Rk,ucr}$	[N/mm <sup>2</sup> ]	7,5	7,5	7,5	7,0	7,0	6,0	5,5	5,0	4,5
		C30/37			•			1,04				
Increasing factors for conc $\Psi_{c}$	rete	C40/50						1,08				
10		C50/60						1,10				
Splitting failure												
Edge distance		C <sub>cr,sp</sub>	[mm]			1,0 · h <sub>ef</sub>	≤2·h <sub>e</sub>	<sub>ff</sub> (2,5 –	$\left(\frac{h}{h_{ef}}\right) \le 2$	2,4 · h <sub>ef</sub>		
Axial distance		S <sub>cr,sp</sub>	[mm]					2 c <sub>cr,sp</sub>				
Installation safety factor (d concrete)	ry and wet	γ2	•			1,2				1	,4	
Installation safety factor (fl	ooded bore hole)	γ2						1,4				

## Mungo Injection System MIT 600 RE for concrete

Performances

Characteristic values of resistance for rebar under tension loads in non-cracked concrete (Design according to TR 029)



	naracteristic val acked concrete							ads in	l	
Anchor size reinforcing	g bar			Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
Steel failure										
Characteristic tension re	esistance	N <sub>Rk,s</sub> =N <sup>0</sup> <sub>Rk,s,seis,C1</sub>	[kN]				$A_{s}\boldsymbol{\cdot}f_{uk}$			
Combined pull-out and	d concrete cone failure		1	•						
Characteristic bond resis	stance in cracked concret	e C20/25								
		τ <sub>Rk,cr</sub>	[N/mm <sup>2</sup> ]	7,5	7,0	6,5	6,0	5,5	5,5	5,5
Temperature range I:	dry and wet concrete	$\tau^0_{Rk,seis,C1}$	[N/mm <sup>2</sup> ]	6,9	6,4	6,2	5,7	5,5	5,5	5,5
40°C/24°C	flooded bore hole	$\tau_{\rm Rk,cr}$	[N/mm <sup>2</sup> ]	7,5	6,5	6,0	5,0	4,5	4,0	4,0
		$\tau^0_{\text{Rk,seis,C1}}$	[N/mm²]	6,9	6,0	5,7	4,8	4,5	4,0	4,0
	dry and wat concrete	$ au_{\mathrm{Rk,cr}}$	[N/mm²]	4,5	4,0	4,0	3,5	3,5	3,5	3,5
Temperature range II:	dry and wet concrete	$\tau^0_{Rk,seis,C1}$	[N/mm <sup>2</sup> ]	4,1	3,7	3,8	3,3	3,5	3,5	3,5
60°Ċ/43°C	flaadad baya bala	τ <sub>Rk,cr</sub>	[N/mm <sup>2</sup> ]	4,5	4,0	4,0	3,5	3,5	3,5	3,0
	flooded bore hole	$\tau^0_{Rk,seis,C1}$	[N/mm <sup>2</sup> ]	4,1	3,7	3,8	3,3	3,5	3,5	3,0
	dry and wat apparate	τ <sub>Rk,cr</sub>	[N/mm <sup>2</sup> ]	4,0	3,5	3,5	3,0	3,0	3,0	3,0
Temperature range III:	dry and wet concrete	$\tau^0_{Rk,seis,C1}$	[N/mm <sup>2</sup> ]	3,7	3,2	3,3	2,9	3,0	3,0	3,0
72°C/43°C	flooded bore hole	τ <sub>Rk,cr</sub>	[N/mm <sup>2</sup> ]	4,0	3,5	3,5	3,0	3,0	3,0	3,0
		$\tau^0_{\text{Rk}, seis, C1}$	[N/mm <sup>2</sup> ]	3,7	3,2	3,3	2,9	3,0	3,0	3,0
· · · · · · · · · · · · · · · · · · ·		C30/37					1,04			
Increasing factors for co (only static or quasi-stati		C40/50					1,08			
Ψc		C50/60					1,10			
Splitting failure		·								
Edge distance		C <sub>cr,sp</sub>	[mm]		1,0 · h,	<sub>ef</sub> ≤2 ⋅ h	<sub>ef</sub> (2,5 –	$\frac{h}{h_{ef}} \le 2$	,4 · h <sub>ef</sub>	
Axial distance		S <sub>cr,sp</sub>	[mm]				2 c <sub>cr,sp</sub>			
Installation safety factor	(dry and wet concrete)	γ <sub>2</sub>	÷		1,2			1	,4	
Installation safety factor	(flooded bore hole)	γ2					1,4			
Mungo Injectior	n System MIT 600	RE for concre	ete							

Performances

Characteristic values of resistance for rebar under tension loads in cracked concrete (Design according to TR 029 or TR 045)



Table C6: Characterist and non-cra										racke	d
Anchor size reinforcing bar			Ø 8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
Steel failure without lever arm			1	1				1	1		1
	V <sub>Rk,s</sub>	[kN]				0,	50 • A <sub>s</sub> •	f <sub>uk</sub>			
Characteristic shear resistance	$V^0_{Rk,s,seis,C1}$	[kN]	Perfor Deter	lo mance mined PD)			0	,44 • A₅ •	f <sub>uk</sub>		
Steel failure with lever arm											
Characteristic bending moment	M <sup>0</sup> <sub>Rk,s</sub>	[Nm]				1.	2 ∙ W <sub>el</sub> ∙	f <sub>uk</sub>			
Characteristic bending moment	M <sup>0</sup> <sub>Rk,s,seis,C1</sub>	[Nm]			No F	Performa	nce Dete	rmined (I	NPD)		
Concrete pry-out failure											
Factor k in equation (5.7) of Technical Report TR 029 for the design of bonded anchors	k	[-]					2,0				
Installation safety factor	γ2	·					1,0				
Concrete edge failure											
Installation safety factor	γ <sub>2</sub>						1,0				

# Mungo Injection System MIT 600 RE for concrete

### Performances

Characteristic values of resistance for rebar under shear loads in cracked and non-cracked concrete, (Design according to TR 029 or TR 045)



				M 8	M 10	M 12	M 16	M 20	M24	M 27	M 30
Steel failure							•		•		•
Characteristic tension resista Steel, property class 4.6	ance,	N <sub>Rk,s</sub>	[kN]	15	23	34	63	98	141	184	224
Characteristic tension resist	ance,	N <sub>Rk.s</sub>	[kN]	18	29	42	78	122	176	230	280
Steel, property class 5.8 Characteristic tension resista	ance.	,					-				
Steel, property class 8.8 Characteristic tension resista		N <sub>Rk,s</sub>	[kN]	29	46	67	125	196	282	368	449
Stainless steel A4 and HCR property class 50 (>M24) an	,	N <sub>Rk,s</sub>	[kN]	26	41	59	110	171	247	230	281
Combined pull-out and co	ncrete failure										
Characteristic bond resistan	ce in non-cracked concret	e C20/25									
Temperature range I:	dry and wet concrete	$\tau_{\rm Rk,ucr}$	[N/mm <sup>2</sup> ]	15	15	15	14	13	12	12	12
40°C/24°C	flooded bore hole	$\tau_{\rm Rk,ucr}$	[N/mm <sup>2</sup> ]	15	14	13	10	9,5	8,5	7,5	7,0
Temperature range II:	dry and wet concrete	$\tau_{\rm Rk,ucr}$	[N/mm <sup>2</sup> ]	9,5	9,5	9,0	8,5	8,0	7,5	7,5	7,5
60°C/43°C	Image III:       Image III: </td <td>9,5</td> <td>9,5</td> <td>9,0</td> <td>8,5</td> <td>7,5</td> <td>7,0</td> <td>6,5</td> <td>6,0</td>	9,5	9,5	9,0	8,5	7,5	7,0	6,5	6,0		
Temperature range III:	dry and wet concrete	$\tau_{\rm Rk,ucr}$	[N/mm <sup>2</sup> ]	8,5	8,5	8,0	7,5	7,0	7,0	6,5	6,5
72°Ċ/43°C	flooded bore hole	$\tau_{\rm Rk,ucr}$	[N/mm <sup>2</sup> ]	8,5	8,5	8,0	7,5	7,0	6,0	5,5	5,5
		C30/37	•				1,			•	
Increasing factors for concr∈ Ψ₀	ete	C40/50					1,	08			
т с		C50/60					1,	10			
Factor according to CEN/TS 1992-4-5 Section 6	.2.2.3	k <sub>8</sub>	[-]				10	),1			
Concrete cone failure											
Factor according to CEN/TS 1992-4-5 Section 6	.2.3.1	k <sub>ucr</sub>	[-]				10	),1			
Edge distance		C <sub>cr,N</sub>	[mm]				1,5	h <sub>et</sub>			
Axial distance		S <sub>cr,N</sub>	[mm]				3,0	h <sub>ef</sub>			
Splitting failure											
Edge distance		C <sub>cr,sp</sub>	[mm]		1	,0 · h <sub>ef</sub> ≤	$2 \cdot h_{ef} (2,$	$5 - \frac{h}{h_{ef}}$	≤ 2,4 · h <sub>e</sub>	əf	
Axial distance		S <sub>cr,sp</sub>	[mm]				2 c	cr,sp			
Installation safety factor (dry	and wet concrete)	γ2	•		1	,2			1	,4	
Installation safety factor (floo	oded bore hole)	γ2					1	,4			

Characteristic values of resistance for threaded rods under tension loads in non-cracked concrete

(Design according to CEN/TS 1992-4)



#### Table C8: Characteristic values of resistance for threaded rods under tension loads in cracked concrete (Design according to CEN/TS 1992-4 or TR 045) Anchor size threaded rod M 12 M 16 M 20 M24 M27 M30 Steel failure Characteristic tension resistance, [kN] 34 63 98 141 184 224 N<sub>Rk,s</sub> = N<sup>0</sup><sub>Rk,s,seis</sub> Steel, property class 4.6 Characteristic tension resistance, [kN] 42 122 176 230 280 N<sub>Rk.s</sub> = N<sup>0</sup><sub>Rk.s.seis</sub> 78 Steel, property class 5.8 Characteristic tension resistance, N<sub>Rk.s</sub>=N<sup>0</sup><sub>Rk.s.seis</sub> [kN] 67 125 196 282 368 449 Steel, property class 8.8 Characteristic tension resistance, Stainless steel A4 and HCR, [kN] 59 110 171 247 230 281 N<sub>Rk,s</sub> = N<sup>0</sup><sub>Rk,s,seis</sub> property class 50 (>M24) and 70 (≤ M24) Combined pull-out and concrete failure Characteristic bond resistance in cracked concrete C20/25 [N/mm<sup>2</sup>] 7,5 5,5 5,5 6,5 6,0 5,5 $\tau_{Rk,cr}$ dry and wet concrete $\tau^0_{Rk,seis,C1}$ [N/mm<sup>2</sup>] 7,1 6,2 5,7 5,5 5,5 5,5 $\tau^0_{Rk,seis,C2}$ No Performance Determined (NPD) Temperature range I: [N/mm<sup>2</sup>] 2,4 2,2 40°C/24°C [N/mm<sup>2</sup>] 7,5 6,0 5,0 4,0 4,0 4.5 $\tau_{Rk.cr}$ flooded bore hole $\tau^0_{Rk,seis,C1}$ 7,1 5,8 4.5 4.0 [N/mm<sup>2</sup>] 4.8 4.0 [N/mm<sup>2</sup>] $\tau^0_{Rk,seis,C2}$ 2,4 2,1 No Performance Determined (NPD) [N/mm<sup>2</sup>] 4.5 4.0 3,5 3,5 3,5 3,5 $\tau_{\text{Rk,cr}}$ $\tau^0_{\frac{Rk,seis,C1}{}}$ 3,5 3,5 [N/mm<sup>2</sup>] 4,3 3,8 3,4 3,5 drv and wet concrete No Performance Determined (NPD) τ<sup>0</sup><sub>Rk,seis,C2</sub> [N/mm<sup>2</sup>] 1,4 1,4 Temperature range II: 60°C/43°C 4,5 4,0 3,5 $\tau_{\text{Rk,cr}}$ [N/mm<sup>2</sup>] 3,5 3,5 3,5 $\tau^0_{Rk,seis,C1}$ flooded bore hole [N/mm<sup>2</sup>] 4,3 3,8 3,4 3,5 3,5 3,5 $\tau^0_{Rk,seis,C2}$ [N/mm<sup>2</sup>] 1,4 1,4 No Performance Determined (NPD) [N/mm<sup>2</sup>] 4,0 3,5 3,0 3,0 3,0 3,0 $\tau_{\text{Rk,cr}}$ $\tau^0_{Rk,seis,C1}$ dry and wet concrete [N/mm<sup>2</sup>] 3,9 3,4 3,0 3,0 3.0 3,0 $\tau^0_{Rk,seis,C2}$ 1,3 1,2 No Performance Determined (NPD) [N/mm<sup>2</sup>] Temperature range III: 72°C/43°C 3,0 3,0 [N/mm<sup>2</sup>] 4,0 3,5 3,0 3.0 $\tau_{\text{Rk,cr}}$ $\tau^0_{Rk,seis,C1}$ flooded bore hole [N/mm<sup>2</sup>] 3,9 3,4 3,0 3,0 3,0 3,0 [N/mm<sup>2</sup>] 1,3 1,2 No Performance Determined (NPD) $\tau^0_{Rk,seis,C2}$ C30/37 1,04 Increasing factors for concrete (only static or quasi-static actions) C40/50 1,08 $\Psi_{c}$ C50/60 1,10 Factor according to 7,2 $k_8$ [-] CEN/TS 1992-4-5 Section 6.2.2.3 Concrete cone failure Factor according to 7.2 k<sub>cr</sub> [-] CEN/TS 1992-4-5 Section 6.2.3.1 Edge distance 1,5 h<sub>ef</sub> C<sub>cr,N</sub> [mm] Axial distance [mm] 3,0 h<sub>ef</sub> S<sub>cr,N</sub> Splitting failure h $1,0 \cdot h_{ef} \leq 2 \cdot h_{ef}$ 2,5 $\leq$ 2,4 $\cdot$ h<sub>ef</sub> Edge distance [mm] C<sub>cr,sp</sub> $h_{ef}$ Axial distance [mm] 2 c<sub>cr,sp</sub> S<sub>cr,sp</sub> Installation safety factor (dry and wet concrete) 1,2 1,4 γz Installation safety factor (flooded bore hole) 1,4 γ<sub>2</sub>

### Mungo Injection System MIT 600 RE for concrete

#### Performances

Characteristic values of resistance for threaded rods under tension loads in cracked concrete (Design according to CEN/TS 1992-4 or TR 045)



# Table C9: Characteristic values of resistance for threaded rods under shear loads in cracked and non-cracked concrete (Design according to CEN/TS 1992-4 or TR 045)

Anchor size threaded rod			M 8	M 10	M 12	M 16	M 20	M24	M 27	M 30
Steel failure without lever arm										
	V <sub>Rk,s</sub>	[kN]	7	12	17	31	49	71	92	112
Characteristic shear resistance, Steel, property class 4.6	$V^0_{Rk,s,seis,C1}$	[kN]	No Perf	ormance	14	27	42	56	72	88
,	$V^0_{Rk,s,seis,C2}$	[kN]	Determin	ed (NPD)	13	25	No Per	rformance	Determined	J (NPD)
	V <sub>Rk,s</sub>	[kN]	9	15	21	39	61	88	115	140
Characteristic shear resistance, Steel, property class 5.8	$V^0_{Rk,s,seis,C1}$	[kN]		ormance	18	34	53	70	91	111
	$V^0_{Rk,s,seis,C2}$	[kN]	Determin	ed (NPD)	17	31	No Per	rformance	Determined	J (NPD)
	V <sub>Rk,s</sub>	[kN]	15	23	34	63	98	141	184	224
Characteristic shear resistance, Steel, property class 8.8	$V^0_{Rk,s,seis,C1}$	[kN]		ormance	30	55	85	111	145	177
	$V^0_{Rk,s,seis,C2}$	[kN]	Determin	ed (NPD)	27	50	No Per	rformance	Determined	J (NPD)
Characteristic shear resistance,	V <sub>Rk,s</sub>	[kN]	13	20	30	55	86	124	115	140
Stainless steel A4 and HCR,	$V^0_{Rk,s,seis,C1}$	[kN]		ormance	26	48	75	98	91	111
property class 50 (>M24) and 70 ( $\leq$ M24)	$V^0_{\rm Rk,s,seis,C2}$	[kN]	Determin	ed (NPD)	24	44	No Per	rformance	Determined	J (NPD)
Ductility factor according to CEN/TS 1992-4-5 Section 6.3.2.1	k <sub>2</sub>					0	,8			
Steel failure with lever arm	I		1							
	M <sup>0</sup> <sub>Rk,s</sub>	[Nm]	15	30	52	133	260	449	666	900
Characteristic bending moment, Steel, property class 4.6	M <sup>0</sup> <sub>Rk,s,seis,C1</sub>	[Nm]			No Bor	formance I	Dotormino			
	M <sup>0</sup> <sub>Rk,s,seis,C2</sub>	[Nm]			NO Fei	ionnance i	Jeterminet			
	M <sup>0</sup> <sub>Rk,s</sub>	[Nm]	19	37	65	166	324	560	833	112
Characteristic bending moment, Steel, property class 5.8	M <sup>0</sup> <sub>Rk,s,seis,C1</sub>	[Nm]			No Por	formance l	Dotormino			
	M <sup>0</sup> <sub>Rk,s,seis,C2</sub>	[Nm]			NO F EI		Jetenninet			
	M <sup>0</sup> <sub>Rk,s</sub>	[Nm]	30	60	105	266	519	896	1333	179
Characteristic bending moment, Steel, property class 8.8	M <sup>0</sup> <sub>Rk,s,seis,C1</sub>	[Nm]			No Per	formance I	Determiner			
	M <sup>0</sup> <sub>Rk,s,seis,C2</sub>	[Nm]								
Characteristic bending moment,	M <sup>0</sup> <sub>Rk,s</sub>	[Nm]	26	52	92	232	454	784	832	112
Stainless steel A4 and HCR, property class 50 (>M24) and 70 ( $\leq$ M24)	M <sup>0</sup> <sub>Rk,s,seis,C1</sub>	[Nm]			No Per	formance l	Determiner			
bioperty class 50 ( $>M24$ ) and 70 ( $\geq M24$ )	$M^0_{Rk,s,seis,C2}$	[Nm]						a (i ti b)		
Concrete pry-out failure										
Factor in equation (27) of CEN/TS 1992-4-5 Section 6.3.3	k <sub>3</sub>					2	,0			
Installation safety factor	γ2					1	,0			
Concrete edge failure <sup>3)</sup>										
Effective length of anchor	l <sub>t</sub>	[mm]				$I_t = min(h$	<sub>et</sub> ; 8 d <sub>nom</sub> )			
Outside diameter of anchor	d <sub>nom</sub>	[mm]	8	10	12	16	20	24	27	30
nstallation safety factor	$\gamma_2$					1	,0			
Maria da la la la calca de la		<b>6</b>								
Mungo Injection System MI	600 RE	for c	oncrete	•					nnex C	

#### Performances

Characteristic values of resistance for threaded rods under shear loads in cracked and non-cracked concrete, (Design according to CEN/TS 1992-4 or TR 045)



$ \begin{array}{ c c c c } \hline An chor size reintorcing bar $$ 0 0 $$ 0 10 $$$ 0 10 $$ 0 10 $$ 0 10 $$ 0 10 $$ 0 10$		aracteristic value									ls in		
	Anchor size reinforcing l	bar			Ø8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
Na.s         (RN)         (RN) $X_{a} - T_{abc}$ Commended pull-out and concrete failure         Characteristic bond resistance in non-cracked concrete $V_{abcord}$ $R_{abcord}$ $R_$	Steel failure					1				1	1	1	
	Characteristic tension resis	stance	N <sub>Rk,s</sub>	[kN]					$A_{s}\boldsymbol{\cdot}f_{uk}$				
$ \begin{array}{ c c c c c c } \hline Term perature range I: \\ Tomperature range I: \\ flooded bore hole \\ $t_{Rk.orr}$ [N/mm^2] $ 14 $ 14 $ 13 $ 11 $ 10 $ 9.5 $ 8.5 $ 7.5 $ 7.0 \\ \hline Term perature range II: \\ flooded bore hole \\ $t_{Rk.orr}$ [N/mm^2] $ 8.5 $ 8.5 $ 8.0 $ 8.0 $ 7.5 $ 7.0 $ 7.0 $ 6.6 $ 6.0 $ 5.5 \\ \hline Term perature range III: \\ flooded bore hole \\ $t_{Rk.orr}$ [N/mm^2] $ 8.5 $ 8.5 $ 8.0 $ 8.0 $ 7.5 $ 7.0 $ 6.0 $ 5.5 $ 5.0 \\ \hline Term perature range III: \\ flooded bore hole \\ $t_{Rk.orr}$ [N/mm^2] $ 7.5 $ 7.5 $ 7.0 $ 7.0 $ 6.0 $ 5.5 $ 5.0 \\ \hline Term perature range III: \\ flooded bore hole \\ $t_{Rk.orr}$ [N/mm^2] $ 7.5 $ 7.5 $ 7.0 $ 7.0 $ 6.0 $ 5.5 $ 5.0 \\ \hline Term perature range III: \\ flooded bore hole \\ $t_{Rk.orr}$ [N/mm^2] $ 7.5 $ 7.5 $ 7.0 $ 7.0 $ 6.0 $ 5.5 $ 5.0 \\ \hline Term perature range III: \\ flooded bore hole \\ $t_{Rk.orr}$ [N/mm^2] $ 7.5 $ 7.5 $ 7.0 $ 7.0 $ 6.0 $ 5.5 $ 5.0 \\ \hline Term perature range III: \\ flooded bore hole \\ $t_{Rk.orr}$ [N/mm^2] $ 7.5 $ 7.5 $ 7.0 $ 7.0 $ 6.0 $ 5.5 $ 5.0 \\ \hline Term perature range III: \\ flooded bore hole \\ $t_{Rk.orr}$ [N/mm^2] $ 7.5 $ 7.5 $ 7.0 $ 7.0 $ 7.0 $ 6.0 $ 5.5 $ 5.0 \\ \hline Term perature range III: \\ flooded bore hole \\ $t_{Rk.orr}$ [N/mm^2] $ 7.5 $ 7.5 $ 7.5 $ 7.0 $ 7.0 $ 7.0 $ 6.0 $ 5.5 $ 5.0 \\ \hline Term perature range III: \\ flooded bore hole \\ $t_{Rk.orr}$ [N/mm^2] $ 7.5 $ 7.5 $ 7.5 $ 7.0 $ 7.0 $ 7.0 $ 6.0 $ 5.5 $ 5.0 \\ \hline Term perature range III: \\ flooded bore hole \\ $t_{Rk.orr}$ [N/mm^2] $ 7.5 $ 7.5 $ 7.5 $ 7.0 $ 7.0 $ 7.0 $ 7.0 $ 7.0 $ 7.0 $ 7.0 $ 7.0 $ 7.0 $ 7.0 $ 7.0 $ 7.0 $ 7.0 $ 7.0 $ 7.0 $ 7.0 $ 7.0 $ 7.0 $ 7.0 $ $ 7.0 $ 7.0 $ 7.0 $ 7.0 $ 7.0 $ 7.0 $ 7.0 $ 7.0 $ 7.0 $ 7.0 $ 7.0 $ 7.0 $ $ 7.0 $ 7.0 $ 7.0 $ 7.0 $ $ 7.0 $ 7.0 $ $ 7.0 $ $ 7.0 $ $ 7.0 $ $ 7.0 $ $ 7.0 $ $ 7.0 $ $ 7.0 $ $ 7.0 $ $ 7.0 $ $ 7.0 $ $ 7.0 $ $ 7.0 $ $ 7.0 $ $ 7.0 $ $ 7.0 $ $ 7.0 $ $ 7.0 $ $ 7.0 $ $ $ 7.0 $ $ 7.0 $ $ 7.0 $ $ $ 7.0 $ $ 7.0 $ $ $ 7.0 $ $ $ 7.0 $ $ $ 7.0 $ $ $ $ $ 7.0 $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $$	Combined pull-out and c	oncrete failure	•										
$ \begin{array}{                                    $	Characteristic bond resista	nce in non-cracked concre	ete C20/2	5									
	Temperature range I:	dry and wet concrete	$\tau_{Rk,ucr}$	[N/mm <sup>2</sup> ]	14	14	13	13	12	12	11	11	11
$\begin{array}{  c     c   c   c   c   c   c   c   c  $	40°C/24°C	flooded bore hole	τ <sub>Rk,ucr</sub>	[N/mm²]	14	13	11	10	9,5	8,5	7,5	7,0	6,0
$ \frac{1000 \text{ do for hole}}{1000 \text{ do for hole}} = \frac{1}{10, \text{ sr}} \frac{[\text{N/mm}^{\text{rm}}]}{10, \text{ sr}} \frac{8,5}{5} \frac{8,5}{5} \frac{8,0}{5} \frac{8,0}{5} \frac{9,0}{7,0} \frac{7,0}{7,0} \frac{6,0}{6,0} \frac{5,5}{6,0} \frac{5,5}{72^{5}} \frac{7,5}{7,5} \frac{7,5}{7,5} \frac{7,0}{7,0} \frac{7,0}{7,0} \frac{6,0}{6,0} \frac{5,5}{5,0} \frac{5,0}{7,5} \frac{7,5}{7,5} \frac{7,5}{7,5} \frac{7,5}{7,0} \frac{7,0}{7,0} \frac{6,0}{6,0} \frac{5,5}{5,0} \frac{5,0}{7,5} \frac{7,5}{7,5} \frac{7,5}{7,5} \frac{7,5}{7,5} \frac{7,5}{7,0} \frac{7,0}{7,0} \frac{6,0}{6,0} \frac{5,5}{5,0} \frac{5,0}{7,5} \frac{7,5}{7,5} \frac{7,5}$	Temperature range II:	dry and wet concrete	$\tau_{Rk,ucr}$	[N/mm²]	8,5	8,5	8,0	8,0	7,5	7,0	7,0	6,5	6,5
$\begin{array}{ c c c c c c } \hline \mbox{Transmits} & Trans$	60°C/43°C	flooded bore hole	$\tau_{Rk,ucr}$	[N/mm <sup>2</sup> ]	8,5	8,5	8,0	8,0	7,5	7,0	6,0	5,5	5,0
$\begin{tabular}{ c c c c c c } \hline \begin{tabular}{ c c c c c c } \hline \begin{tabular}{ c c c c c c c } \hline \hline \begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	Temperature range III:	dry and wet concrete	τ <sub>Rk,ucr</sub>	[N/mm²]	7,5	7,5	7,5	7,0	7,0	6,5	6,0	6,0	6,0
$\begin{array}{ c c c c c c } \hline \begin{tabular}{ c c c c c } \hline \hline C40/50 & 1,08 & \hline \hline C50/60 & 1,10 & \hline \hline \hline C50/60 & 1,10 & \hline \hline \hline C50/75 1992.4-5 Section 6.2.2.3 & k_8 & [-] & 10,1 & \hline \hline \hline \hline CEN/TS 1992.4-5 Section 6.2.3.1 & k_{urr} & [-] & 10,1 & \hline \hline \hline CEN/TS 1992.4-5 Section 6.2.3.1 & k_{urr} & [-] & 10,1 & \hline \hline \hline CEN/TS 1992.4-5 Section 6.2.3.1 & k_{urr} & [-] & 10,1 & \hline \hline \hline CEN/TS 1992.4-5 Section 6.2.3.1 & k_{urr} & [-] & 10,1 & \hline \hline \hline CEN/TS 1992.4-5 Section 6.2.3.1 & k_{urr} & [-] & 10,1 & \hline \hline \hline CEN/TS 1992.4-5 Section 6.2.3.1 & k_{urr} & [-] & 10,1 & \hline \hline \hline CEN/TS 1992.4-5 Section 6.2.3.1 & k_{urr} & [-] & 10,1 & \hline \hline \hline \hline CEN/TS 1992.4-5 Section 6.2.3.1 & k_{urr} & [-] & 10,1 & \hline \hline \hline CEN/TS 1992.4-5 Section 6.2.3.1 & k_{urr} & [-] & 10,1 & \hline \hline \hline CEN/TS 1992.4-5 Section 6.2.3.1 & k_{urr} & [-] & 10,1 & \hline \hline \hline CEN/TS 1992.4-5 Section 6.2.3.1 & k_{urr} & [-] & 10,1 & \hline \hline \hline \hline CEN/TS 1992.4-5 Section 6.2.3.1 & k_{urr} & [-] & 10,1 & \hline \hline \hline CEN/TS 1992.4-5 Section 6.2.3.1 & k_{urr} & [-] & 10,1 & \hline \hline \hline CEN/TS 1992.4-5 Section 6.2.3.1 & k_{urr} & [-] & 10,1 & \hline \hline \hline CEN/TS 1992.4-5 Section 6.2.3.1 & k_{urr} & [-] & 10,1 & \hline \hline \hline CEN/TS 1992.4-5 Section 6.2.3.1 & k_{urr} & [-] & 10,1 & \hline \hline \hline CEN/TS 1992.4-5 Section 6.2.3.1 & k_{urr} & [-] & 10,1 & \hline \hline \hline CEN/TS 1992.4-5 Section 6.2.3.1 & k_{urr} & [-] & 1,0 & \hline \hline \ Splitting failure & \hline \hline \ Section 6.2.3 & k_{urr} & [-] & \hline \hline \ Cen/TS & [-] & 1,0 & \hline \hline \ Cen/TS & [-] & 1,0 & \hline \hline \ Splitting failure & \hline \hline \ Section 6.2 & k_{urr} & [-] & \hline \hline \ Cen/TS & [-] & k_{urr} & [-] & 1,2 & \hline \hline \ \ Axial distance & $s_{urr} & $s_{$	72°Ċ/43°C	flooded bore hole	$\tau_{Rk,ucr}$	[N/mm²]	7,5	7,5	7,5	7,0	7,0	6,0	5,5	5,0	4,5
Ve     108       Factor according to CEN/TS 1992-4-5 Section 6.2.2.3     ks     [-]     10,1       Concrete cone failure       Factor according to CEN/TS 1992-4-5 Section 6.2.3.1     ksor     [-]     10,1       Edge distance $c_{cr.N}$ [mm]     1,5 hal       Axial distance $s_{cr.N}$ [mm]     3,0 hal       Splitting failure       Edge distance $c_{cr.sp}$ [mm] $1,0 \cdot h_{ef} \le 2 \cdot h_{ef} (25 - \frac{h}{h_{of}}) \le 24 \cdot h_{ef}$ Axial distance $s_{cr.sp}$ [mm] $2 \cdot c_{or.sp}$ Installation safety factor (dry and wet concrete) $\gamma_2$ 1,2     1,4			C30/37						1,04				
Factor according to CEN/TS 1992-4-5 Section 6.2.2.3     k <sub>8</sub> [-]     10,1       Factor according to CONCrete cone failure     Kurr     [-]     10,1       Edge distance     c <sub>er.N</sub> [mm]     1,5 h <sub>ef</sub> Axial distance     s <sub>er.N</sub> [mm]     3,0 h <sub>ef</sub> Splitting failure       Edge distance     c <sub>er.sp</sub> [mm]     10 · h <sub>of</sub> ≤ 2 · h <sub>ef</sub> $\left(2.5 - \frac{h}{h_{ef}}\right) \le 2.4 \cdot h_{of}$ Axial distance     s <sub>er.sp</sub> [mm]     2 c <sub>er.sp</sub> Installation safety factor (dry and wet concrete) $\gamma_2$ 1,2     1,4	-	rete	C40/50						1,08				
CEN/TS 1992-4-5 Section 6.2.2.3 $R_8$ [-]       10,1         Concrete cone failure         Factor according to CEN/TS 1992-4-5 Section 6.2.3.1 $k_{uor}$ [-]       10,1         Edge distance $c_{cr,N}$ [mm]       1,5 h_{eff}         Axial distance $s_{cr,N}$ [mm]       3,0 h_{eff}         Splitting failure       Edge distance $c_{cr,sp}$ [mm] $10 \cdot h_{eff} \le 2 \cdot h_{eff} \left( 2.5 - \frac{h}{h_{eff}} \right) \le 2.4 \cdot h_{eff}$ Axial distance $s_{cr,sp}$ [mm] $2 c_{cr,sp}$ 1,4         Installation safety factor (dry and wet concrete) $\gamma_2$ 1,2       1,4         Installation safety factor (flooded bore hole) $\gamma_2$ 1,4       1			C50/60						1,10				
Factor according to CEN/TS 1992-4-5 Section 6.2.3.1       k_{strr}       [-]       10,1         Edge distance $c_{er,N}$ [mm]       1,5 h_{el}         Axial distance $s_{er,N}$ [mm]       3,0 h_{el}         Splitting failure       Edge distance $c_{er,ap}$ [mm] $1,0 \cdot h_{of} \le 2 \cdot h_{of} \left( 2,5 - \frac{h}{h_{of}} \right) \le 2,4 \cdot h_{of}$ Axial distance $s_{er,ap}$ [mm] $2 c_{er,ap}$ Installation safety factor (dry and wet concrete) $\gamma_2$ 1,2       1,4         Installation safety factor (flooded bore hole) $\gamma_2$ 1,4       1,4		6.2.2.3	k <sub>8</sub>	[-]					10,1				
CEN/TS 1992-4-5 Section 6.2.3.1       Nor       I'I       10,1         Edge distance $c_{ar,N}$ [mm]       1,5 h_{el}         Axial distance $s_{ar,N}$ [mm]       3,0 h_{el}         Splitting failure       Edge distance $c_{ar,pp}$ [mm] $10 \cdot h_{ef} \le 2 \cdot h_{ef} \left( 2,5 - \frac{h}{h_{ef}} \right) \le 2,4 \cdot h_{ef}$ Axial distance $s_{or,pp}$ [mm] $10 \cdot h_{ef} \le 2 \cdot h_{ef} \left( 2,5 - \frac{h}{h_{ef}} \right) \le 2,4 \cdot h_{ef}$ Axial distance $s_{or,pp}$ [mm] $2 c_{ar,sp}$ Installation safety factor (dry and wet concrete) $\gamma_2$ $1,2$ $1,4$	Concrete cone failure												
Axial distance $s_{or,N}$ [mm]       3,0 h_{ef}         Splitting failure       Edge distance $c_{or,sp}$ [mm] $1,0 \cdot h_{ef} \le 2 \cdot h_{ef} (2.5 - \frac{h}{h_{ef}}) \le 2.4 \cdot h_{ef}$ Axial distance $s_{or,sp}$ [mm] $1,0 \cdot h_{ef} \le 2 \cdot h_{ef} (2.5 - \frac{h}{h_{ef}}) \le 2.4 \cdot h_{ef}$ Axial distance $s_{or,sp}$ [mm] $2 c_{or,sp}$ Installation safety factor (dry and wet concrete) $\gamma_2$ $1,2$ $1,4$ Installation safety factor (flooded bore hole) $\gamma_2$ $1,4$ $1,4$	Factor according to CEN/TS 1992-4-5 Section	6.2.3.1	k <sub>ucr</sub>	[-]					10,1				
Splitting failure       Image: Splitting failure         Edge distance $c_{cr.sp}$ [mm] $1,0 \cdot h_{ef} \le 2 \cdot h_{ef} \left(2,5 - \frac{h}{h_{ef}}\right) \le 2,4 \cdot h_{ef}$ Axial distance $s_{cr.sp}$ [mm] $2 c_{cr.sp}$ Installation safety factor (dry and wet concrete) $\gamma_2$ $1,2$ $1,4$ Installation safety factor (flooded bore hole) $\gamma_2$ $1,4$	Edge distance		C <sub>cr,N</sub>	[mm]					1,5 h <sub>et</sub>				
Edge distance $c_{or.sp}$ [mm] $1,0 \cdot h_{ef} \le 2 \cdot h_{ef} \left(2,5 - \frac{h}{h_{ef}}\right) \le 2,4 \cdot h_{ef}$ Axial distance $s_{or.sp}$ [mm] $2 c_{or.sp}$ Installation safety factor (dry and wet concrete) $\gamma_2$ $1,2$ $1,4$ Installation safety factor (flooded bore hole) $\gamma_2$ $1,4$	Axial distance		S <sub>cr,N</sub>	[mm]					3,0 h <sub>ef</sub>				
Axial distance     s <sub>or.sp</sub> [mm]     2 c <sub>or.sp</sub> Installation safety factor (dry and wet concrete) $\gamma_2$ 1,2     1,4       Installation safety factor (flooded bore hole) $\gamma_2$ 1,4	Splitting failure				-								
Installation safety factor (dry and wet concrete) 72 1,2 1,4 Installation safety factor (flooded bore hole) 72 1,4	Edge distance		C <sub>cr,sp</sub>	[mm]			1,0 · h <sub>e</sub>	<sub>ef</sub> ≤2 · h,	ef (2,5	<u>h</u> h <sub>ef</sub> )≤2	,4 ⋅ h <sub>ef</sub>		
Installation safety factor (flooded bore hole) γ2 1,4	Axial distance		S <sub>cr,sp</sub>	[mm]					$2 c_{\text{cr,sp}}$				
	Installation safety factor (d	ry and wet concrete)	γ2				1,2				1	,4	
	Installation safety factor (fl	ooded bore hole)	γ2						1,4				
Munde Injection Quotem MIT 600 DE for accorde													
Mungo Injection System MIT 600 RE for concrete Performances Annex C 1		System MIT 600 R	E for c	oncrete						-	۸۳۳۵	v C 1/	n

Characteristic values of resistance for rebar under tension loads in non-cracked concrete

(Design according to CEN/TS 1992-4)



	aracteristic valu ncrete (Design a							ds in (	cracke	эd
Anchor size reinforcing	g bar			Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
Steel failure				•						
Characteristic tension re	esistance	$N_{\text{Rk},s} = N_{\text{Rk},s,seis,C1}^{0}$	[kN]				$A_{s} \boldsymbol{\cdot} f_{uk}$			
Combined pull-out and	l concrete failure									
Characteristic bond resis	stance in cracked concre	te C20/25								
		$\tau_{Rk,cr}$	[N/mm <sup>2</sup> ]	7,5	7,0	6,5	6,0	5,5	5,5	5,5
Temperature range I:	dry and wet concrete	$\tau^0_{Rk,seis,C1}$	[N/mm <sup>2</sup> ]	6,9	6,4	6,2	5,7	5,5	5,5	5,5
40°C/24°C		$\tau_{Rk,cr}$	[N/mm <sup>2</sup> ]	7,5	6,5	6,0	5,0	4,5	4,0	4,0
	flooded bore hole	$\tau^0_{Rk,seis,C1}$	[N/mm <sup>2</sup> ]	6,9	6,0	5,7	4,8	4,5	4,0	4,0
		τ <sub>Rk,cr</sub>	[N/mm <sup>2</sup> ]	4,5	4,0	4,0	3,5	3,5	3,5	3,5
Temperature range II:	dry and wet concrete	$\tau^0_{Rk,seis,C1}$	[N/mm <sup>2</sup> ]	4,1	3,7	3,8	3,3	3,5	3,5	3,5
60°C/43°C		τ <sub>Rk,cr</sub>	[N/mm <sup>2</sup> ]	4,5	4,0	4,0	3,5	3,5	3,5	3,0
	flooded bore hole	τ <sup>0</sup> <sub>Rk,seis,C1</sub>	[N/mm <sup>2</sup> ]	4,1	3,7	3,8	3,3	3,5	3,5	3,0
		τ <sub>Rk,cr</sub>	[N/mm <sup>2</sup> ]	4,0	3,5	3,5	3,0	3,0	3,0	3,0
	dry and wet concrete	τ <sup>0</sup> <sub>Rk,seis,C1</sub>	[N/mm <sup>2</sup> ]	3,7	3,2	3,3	2,9	3,0	3,0	3,0
Temperature range III: 72°C/43°C		τ <sub>Rk,cr</sub>	[N/mm <sup>2</sup> ]	4,0	3,5	3,5	3,0	3,0	3,0	3,0
	flooded bore hole	τ <sup>0</sup> <sub>Rk,seis,C1</sub>	[N/mm <sup>2</sup> ]	3,7	3,2	3,3	2,9	3,0	3,0	3,0
Increasing factors for co		C30/37	<u> </u>			,	1,04			
(only static or quasi-stati		C40/50					1,08			
Ψ.		C50/60					1,10			
Factor according to CEN/TS 1992-4-5 Section	on 6.2.2.3	k <sub>8</sub>	[-]				7,2			
Concrete cone failure										
Factor according to CEN/TS 1992-4-5 Section		k <sub>cr</sub>	[-]				7,2			
Edge distance		C <sub>cr,N</sub>	[mm]				1,5 h <sub>et</sub>			
Axial distance		S <sub>cr,N</sub>	[mm]				3,0 h <sub>ef</sub>			
Splitting failure										
Edge distance		C <sub>cr,sp</sub>	[mm]		1,0 ·	h <sub>ef</sub> ≤2⋅h	$r_{ef}\left(2,5-\frac{1}{r}\right)$	$\frac{h}{n_{ef}} \le 2,4$	∙h <sub>ef</sub>	
Axial distance		S <sub>cr,sp</sub>	[mm]				2 c <sub>cr,sp</sub>			
Installation safety factor	(dry and wet concrete)	γ <sub>2</sub>			1,2			1	,4	
Installation safety factor	(flooded bore hole)	γ <sub>2</sub>					1,4			
Performances Characteristic values	n System MIT 600 s of resistance for reba o CEN/TS 1992-4 or T	ar under tension lo		ked cond	crete			Ann	ex C 1	11



Table C12: Characteristic value and non-cracked co											
Anchor size reinforcing bar			Ø 8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
Steel failure without lever arm											
	V <sub>Rk,s</sub>	[kN]				0,	50 • A <sub>s</sub> •	f <sub>uk</sub>			
Characteristic shear resistance	V <sup>0</sup> Rk,s,seis,C1	[kN]	Perfor	lo mance mined PD)			0,4	14 • A <sub>s</sub> •	f <sub>uk</sub>		
Ductility factor according to CEN/TS 1992-4-5 Section 6.3.2.1	k <sub>2</sub>						0,8				
Steel failure with lever arm											
Characteristic bending moment	M <sup>o</sup> <sub>Rk,s</sub>	[Nm]				1.:	2 ∙ W <sub>el</sub> ∙	f <sub>uk</sub>			
Characteristic bending moment	$M^0_{\ Rk,s,seis,C1}$	[Nm]			No P€	erformar	ice Dete	rmined	(NPD)		
Concrete pry-out failure											
Factor in equation (27) of CEN/TS 1992-4-5 Section 6.3.3	k <sub>3</sub>						2,0				
Installation safety factor	γ2						1,0				
Concrete edge failure											
Effective length of anchor	l <sub>f</sub>	[mm]				$I_f = rr$	nin(h <sub>ef</sub> ; 8	d <sub>nom</sub> )			
Outside diameter of anchor	d <sub>nom</sub>	[mm]	8	10	12	14	16	20	25	28	32
Installation safety factor	γ2						1,0				

# Mungo Injection System MIT 600 RE for concrete

### Performances

Characteristic values of resistance for rebar under shear loads in cracked and non-cracked concrete, (Design according to CEN/TS 1992-4 or TR 045)



Anchor size thread	ded rod		M 8	M 10	M 12	M 16	M 20	M24	M 27	M 30
Non-cracked conc	rete C20/25	under static and	quasi-statio	action			L	1		
Temperature range I:	$\delta_{N0}$ -factor	[mm/(N/mm <sup>2</sup> )]	0,011	0,013	0,015	0,020	0,024	0,029	0,032	0,03
40°C/24°Cັ	$\delta_{N_{\infty}}$ -factor	[mm/(N/mm <sup>2</sup> )]	0,044	0,052	0,061	0,079	0,096	0,114	0,127	0,140
Temperature range II:	$\delta_{N0}$ -factor	[mm/(N/mm <sup>2</sup> )]	0,013	0,015	0,018	0,023	0,028	0,033	0,037	0,04
60°C/43°C	$\delta_{N\infty}$ -factor	[mm/(N/mm <sup>2</sup> )]	0,050	0,060	0,070	0,091	0,111	0,131	0,146	0,16
Temperature range III:	$\delta_{N0}$ -factor	[mm/(N/mm <sup>2</sup> )]	0,013	0,015	0,018	0,023	0,028	0,033	0,037	0,04
72°C/43°C	$\delta_{N_\infty}\text{-factor}$	[mm/(N/mm²)]	0,050	0,060	0,070	0,091	0,111	0,131	0,146	0,16
Cracked concrete	C20/25 und	ler static, quasi-sta	atic and sei	ismic C	1 action					
Temperature range I:	$\delta_{N0}$ -factor	[mm/(N/mm <sup>2</sup> )]			0,032	0,037	0,042	0,048	0,053	0,05
40°C/24°C	$\delta_{N_{\infty}}$ -factor	[mm/(N/mm <sup>2</sup> )]			0,21	0,21	0,21	0,21	0,21	0,2
Temperature range II:	$\delta_{N0}$ -factor	[mm/(N/mm <sup>2</sup> )]		ormance mined	0,037	0,043	0,049	0,055	0,061	0,06
60°C/43°C	$\delta_{N\infty}\text{-}factor$	[mm/(N/mm <sup>2</sup> )]		PD)	0,24	0,24	0,24	0,24	0,24	0,24
Temperature range III:	$\delta_{N0}$ -factor	[mm/(N/mm <sup>2</sup> )]			0,037	0,043	0,049	0,055	0,061	0,06
72°C/43°C	$\delta_{N_\infty}\text{-factor}$	[mm/(N/mm <sup>2</sup> )]			0,24	0,24	0,24	0,24	0,24	0,24
Cracked concrete	C20/25 und	ler seismic C2 acti	on							
Temperature range I:	$\delta_{N,seis(DLS)}$	[mm/(N/mm <sup>2</sup> )]			0,03	0,05				
40°C/24°C	δ <sub>N,seis(ULS)</sub>	[mm/(N/mm <sup>2</sup> )]			0,06	0,09				
Temperature range II:	$\delta_{N,seis(DLS)}$	[mm/(N/mm <sup>2</sup> )]		ormance	0,03	0,05	No Douf		Determeine	
60°C/43°C	$\delta_{N,seis(ULS)}$	[mm/(N/mm <sup>2</sup> )]		mined PD)	0,06	0,09	No Perr	ormance l	Jetermine	a (NPL
Temperature range III:	$\delta_{N,seis(DLS)}$	[mm/(N/mm²)]			0,03	0,05				
Temperature range III: 72°C/43°C <sup>1)</sup> Calculation of th $\delta_{N0} = \delta_{N0}$ -factor $\delta_{N\infty} = \delta_{N\infty}$ -factor	$\delta_{N,seis(ULS)}$ e displaceme $\cdot \tau$ ;	[mm/(N/mm <sup>2</sup> )]			0,03 0,06	0,05				
<sup>1)</sup> Calculation of th $\delta_{N0} = \delta_{N0}$ -factor $\delta_{N\infty} = \delta_{N\infty}$ -factor	$\begin{array}{c} \delta_{\text{N,seis(ULS)}} \\ \text{e displaceme} \\ \cdot \ \tau; \\ \cdot \ \tau; \end{array}$	[mm/(N/mm <sup>2</sup> )]	ur load <sup>1)</sup> (1		0,06	0,09				
<sup>1)</sup> Calculation of th $\delta_{N0} = \delta_{N0}$ -factor $\delta_{N\infty} = \delta_{N\infty}$ -factor <b>Table C14: Di</b>	$\delta_{N,seis(ULS)}$ e displaceme · $\tau$ ; · $\tau$ ; splaceme	[mm/(N/mm²)]	nr load <sup>1)</sup> (1 м 8		0,06	0,09	M 20	M24	M 27	M 30
<sup>1)</sup> Calculation of th $\delta_{N0} = \delta_{N0}$ -factor $\delta_{N\infty} = \delta_{N\infty}$ -factor <b>Table C14: Di</b> Anchor size thread	$\begin{array}{ c c }\hline \delta_{N,seis(ULS)}\\ e \ displaceme\\ \cdot \ \tau;\\ \cdot \ \tau;\\ splaceme\\ ded \ rod \end{array}$	[mm/(N/mm <sup>2</sup> )] nt	M 8	thread M 10	0,06 ed rod M 12	0,09 ) M 16			M 27	M 30
<sup>1)</sup> Calculation of th $\delta_{N0} = \delta_{N0}$ -factor $\delta_{N\infty} = \delta_{N\infty}$ -factor <b>Table C14: Di</b> Anchor size thread	$\begin{array}{ c c }\hline \delta_{N,seis(ULS)}\\ e \ displaceme\\ \cdot \ \tau;\\ \cdot \ \tau;\\ splaceme\\ ded \ rod \end{array}$	[mm/(N/mm <sup>2</sup> )] nt	M 8	thread M 10	0,06 ed rod M 12	0,09 ) M 16			<b>M 27</b>	
<sup>1)</sup> Calculation of th $\delta_{N0} = \delta_{N0}$ -factor $\delta_{N\infty} = \delta_{N\infty}$ -factor <b>Table C14: Di</b> <b>Anchor size thread</b> <b>Non-cracked and o</b> All temperature	$\begin{array}{c} \delta_{N,seis(ULS)} \\ e \ displaceme \\ \cdot \ \tau; \\ splaceme \\ ded \ rod \\ cracked \ cor \\ \delta_{V0} \mbox{-}factor \\ \end{array}$	[mm/(N/mm²)] nt ents under shea ncrete C20/25 under [mm/(kN)]	M 8 er static, qu 0,06	thread M 10 Jasi-stat	0,06 ed rod M 12 tic and s 0,05	0,09 ) M 16 seismic 0,04	<b>C1 act</b> 0,04	i <b>on</b> 0,03		0,03
<sup>1)</sup> Calculation of th $\delta_{N0} = \delta_{N0}$ -factor $\delta_{N\infty} = \delta_{N\infty}$ -factor <b>Table C14: Di</b> <b>Anchor size thread</b> <b>Non-cracked and o</b> All temperature ranges	$\begin{array}{c} \delta_{N,seis(ULS)} \\ e \ displaceme \\ \cdot \ \tau; \\ \cdot \ \tau; \\ \end{array} \\ splaceme \\ ded \ rod \\ \hline cracked \ cor \\ \hline \delta_{V0} \mbox{-}factor \\ \hline \delta_{V\infty} \mbox{-}factor \\ \end{array}$	[mm/(N/mm <sup>2</sup> )] nt ents under shea ncrete C20/25 unde [mm/(kN)] [mm/(kN)]	M 8 er static, qu 0,06 0,09	thread M 10 Jasi-stat	0,06 ed rod M 12 tic and s	0,09 ) M 16 seismic	C1 act	ion	0,03	0,03
<sup>1)</sup> Calculation of th $\delta_{N0} = \delta_{N0}$ -factor $\delta_{N\infty} = \delta_{N\infty}$ -factor <b>Table C14: Di</b> <b>Anchor size thread</b> <b>Non-cracked and o</b> All temperature ranges <b>Cracked concrete</b>	$\begin{array}{c} \delta_{N,seis(ULS)} \\ e \ displaceme \\ \cdot \ \tau; \\ \cdot \ \tau; \\ splaceme \\ ded \ rod \\ cracked \ cor \\ \hline \delta_{Vo} \mbox{-}factor \\ \hline \delta_{V\infty} \mbox{-}factor \\ \hline C20/25 \ und \\ \end{array}$	[mm/(N/mm <sup>2</sup> )] nt ents under shea ncrete C20/25 unde [mm/(kN)] [mm/(kN)]	M 8 er static, qu 0,06 0,09 on	thread M 10 Jasi-stat 0,06 0,08	0,06 ed rod M 12 tic and s 0,05 0,08	0,09 ) M 16 seismic 0,04 0,06	<b>C1 act</b> 0,04	i <b>on</b> 0,03	0,03	<b>M 30</b> 0,03 0,05
$72^{\circ}C/43^{\circ}C$ <sup>1)</sup> Calculation of th $\delta_{N0} = \delta_{N0}$ -factor $\delta_{N\infty} = \delta_{N\infty}$ -factor <b>Table C14: Di</b> <b>Anchor size thread</b> <b>Non-cracked and d</b> All temperature ranges <b>Cracked concrete</b> All temperature	$\begin{array}{c} \delta_{\text{N,seis}(\text{ULS})} \\ \text{e displaceme} \\ \cdot \tau; \\ \cdot \tau; \\ \\ \textbf{splaceme} \\ \\ \textbf{ded rod} \\ \\ \hline \textbf{cracked cor} \\ \hline \delta_{\text{V0}}\text{-factor} \\ \hline \delta_{\text{Vo}}\text{-factor} \\ \\ \hline \textbf{C20/25 und} \\ \hline \delta_{\text{V,seis}(\text{DLS})} \\ \end{array}$	ents under shea	M 8 er static, qu 0,06 0,09 on No Perfe Deter	thread M 10 Jasi-stat 0,06 0,08	0,06 ed rod M 12 tic and s 0,05 0,08	0,09 ) M 16 seismic 0,04 0,06 0,1	<b>C1 act</b> 0,04 0,06	i <b>on</b> 0,03	0,03	0,03
<sup>1)</sup> Calculation of th $\delta_{N0} = \delta_{N0}$ -factor $\delta_{N\infty} = \delta_{N\infty}$ -factor <b>Table C14: Di</b> <b>Anchor size thread</b> <b>Non-cracked and d</b> All temperature ranges <b>Cracked concrete</b> All temperature ranges	$\begin{array}{c} \delta_{N,seis(ULS)} \\ e \ displaceme \\ \cdot \ \tau; \\ splaceme \\ ded \ rod \\ cracked \ cor \\ \delta_{V0} \mbox{-} factor \\ \hline \delta_{V,seis(DLS)} \\ \delta_{V,seis(ULS)} \\ \end{array}$	[mm/(N/mm²)]         nt         ents under shea         ncrete C20/25 under         [mm/(kN)]         [mm/(kN)]         [mm/(kN)]         [er seismic C2 acti         [mm/kN]         [mm/kN]	M 8 er static, qu 0,06 0,09 on No Perfe Deter	thread M 10 Jasi-stat 0,06 0,08	0,06 ed rod M 12 tic and s 0,05 0,08	0,09 ) M 16 seismic 0,04 0,06	<b>C1 act</b> 0,04 0,06	ion 0,03 0,05	0,03	0,0
<sup>1)</sup> Calculation of th $\delta_{N0} = \delta_{N0}$ -factor $\delta_{N\infty} = \delta_{N\infty}$ -factor <b>Table C14: Di</b> <b>Anchor size thread</b> <b>Non-cracked and d</b> All temperature ranges <b>Cracked concrete</b> All temperature	$\begin{array}{c} \overline{\delta}_{N,seis(ULS)} \\ e \ displaceme \\ \cdot \ \tau; \\ \cdot \ \tau; \\ \end{array} \\ \begin{array}{c} splaceme \\ \hline ded \ rod \\ \hline cracked \ cor \\ \hline \delta_{V0} \mbox{-}factor \\ \hline \delta_{V_{0}} \mbox{-}factor \\ \hline cracked \ cor \\ \hline \delta_{V,seis(DLS)} \\ \hline \delta_{V,seis(ULS)} \\ \hline e \ displaceme \\ \cdot \ V; \\ \end{array} $	[mm/(N/mm²)]         nt         ents under shea         ncrete C20/25 under         [mm/(kN)]         [mm/(kN)]         [mm/(kN)]         [er seismic C2 acti         [mm/kN]         [mm/kN]	M 8 er static, qu 0,06 0,09 on No Perfe Deter	thread M 10 Jasi-stat 0,06 0,08	0,06 ed rod M 12 tic and s 0,05 0,08	0,09 ) M 16 seismic 0,04 0,06 0,1	<b>C1 act</b> 0,04 0,06	ion 0,03 0,05	0,03	0,03
<sup>1)</sup> Calculation of th $\delta_{N0} = \delta_{N0}$ -factor $\delta_{N\infty} = \delta_{N\infty}$ -factor <b>Table C14: Di</b> <b>Anchor size thread</b> <b>Non-cracked and d</b> <b>Anchor size thread</b> <b>Anchor size thread th</b>	$\begin{array}{c} \overline{\delta}_{N,seis(ULS)} \\ e \ displaceme \\ \cdot \ \tau; \\ splaceme \\ ded \ rod \\ cracked \ cor \\ \overline{\delta}_{Vo}-factor \\ \overline{\delta}_{Vo}-factor \\ \hline cracked \ cor \\ \overline{\delta}_{V,seis(ULS)} \\ \overline{\delta}_{V,seis(ULS)} \\ e \ displaceme \\ \cdot \ V; \\ \cdot \ V; \end{array}$	[mm/(N/mm²)]         nt         ents under shea         ncrete C20/25 under         [mm/(kN)]         [mm/(kN)]         [mm/(kN)]         [er seismic C2 acti         [mm/kN]         [mm/kN]	M 8 er static, qu 0,06 0,09 on No Perfi Deter (NI	thread M 10 Jasi-stat 0,06 0,08	0,06 ed rod M 12 tic and s 0,05 0,08	0,09 ) M 16 seismic 0,04 0,06 0,1	<b>C1 act</b> 0,04 0,06	ion 0,03 0,05	0,03	0,03



Anchor size reinfo	orcing bar		Ø 8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
Non-cracked cone	crete C20/	25 under static	and qua	asi-stati	c action	้า			•		
Temperature range I:	$\delta_{N0}$ -factor	[mm/(N/mm <sup>2</sup> )]	0,011	0,013	0,015	0,018	0,020	0,024	0,030	0,033	0,037
40°C/24°C	$\delta_{N\infty}$ -factor	[mm/(N/mm <sup>2</sup> )]	0,044	0,052	0,061	0,070	0,079	0,096	0,118	0,132	0,149
Temperature range II:	$\delta_{N0}$ -factor	[mm/(N/mm <sup>2</sup> )]	0,013	0,015	0,018	0,020	0,023	0,028	0,034	0,038	0,043
60°C/43°C	$\delta_{N_\infty}\text{-factor}$	[mm/(N/mm <sup>2</sup> )]	0,050	0,060	0,070	0,081	0,091	0,111	0,136	0,151	0,172
Temperature range III:	$\delta_{N0}$ -factor	[mm/(N/mm <sup>2</sup> )]	0,013	0,015	0,018	0,020	0,023	0,028	0,034	0,038	0,043
72°C/43°C	$\delta_{N_\infty}\text{-factor}$	[mm/(N/mm <sup>2</sup> )]	0,050	0,060	0,070	0,081	0,091	0,111	0,136	0,151	0,17
Cracked concrete	C20/25 u	nder static, qua	isi-statio	c and se	eismic C	C1 actio	n				
Temperature range I:	$\delta_{N0}$ -factor	[mm/(N/mm <sup>2</sup> )]			0,032	0,035	0,037	0,042	0,049	0,055	0,06
40°C/24°C	$\delta_{N_{\infty}}$ -factor	[mm/(N/mm <sup>2</sup> )]		-	0,21	0,21	0,21	0,21	0,21	0,21	0,21
Temperature range II:	$\delta_{N0}$ -factor	[mm/(N/mm <sup>2</sup> )]			0,037	0,040	0,043	0,049	0,056	0,063	0,07
60°C/43°C	$\delta_{N_\infty}\text{-factor}$	[mm/(N/mm <sup>2</sup> )]		-	0,24	0,24	0,24	0,24	0,24	0,24	0,24
Temperature range III:	$\delta_{N0}$ -factor	[mm/(N/mm <sup>2</sup> )]		-	0,037	0,040	0,043	0,049	0,056	0,063	0,07
72°C/43°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]		-	0,24	0,24	0,24	0,24	0,24	0,24	0,24
<sup>1)</sup> Calculation of th $\delta_{N0} = \delta_{N0}$ -factor $\delta_{N\infty} = \delta_{N\infty}$ -factor <b>Table C16: D</b>	τ; τ; isplacen	nent under s	hear lo	oad <sup>1)</sup> (r	ebar)						
$\begin{split} \delta_{N0} &= \delta_{N0} \text{-factor} \\ \delta_{N\infty} &= \delta_{N\infty} \text{-factor} \end{split}$ Table C16: D	τ; τ; isplacen	nent under s	hear lo Ø 8	øad <sup>1)</sup> (re Ø 10	ebar) Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø3
$\begin{array}{l} \delta_{N0} =  \delta_{N0} \text{-factor} \\ \delta_{N\infty} =  \delta_{N\infty} \text{-factor} \end{array}$	τ; τ; isplacen prcing bar	nent under s	Ø 8	Ø 10	Ø 12		Ø 16	Ø 20	Ø 25	Ø 28	Ø 3:
$\begin{split} \delta_{N0} &= \delta_{N0} \text{-factor} \\ \delta_{N\infty} &= \delta_{N\infty} \text{-factor} \end{split}$ Table C16: D Anchor size reinfo For concrete C20/	τ; τ; isplacen prcing bar	nent under s	Ø 8 atic and 0,06	Ø 10 seismid 0,05	Ø 12 C1 act 0,05	t <b>ion</b> 0,04	0,04	0,04	0,03	0,03	0,03
$\begin{split} \delta_{N0} &= \delta_{N0} \text{-factor} \\ \delta_{N\infty} &= \delta_{N\infty} \text{-factor} \end{split}$ <b>Table C16: D Anchor size reinfo For concrete C20</b> / All temperature ranges <sup>1)</sup> Calculation of the second seco	τ; τ; <b>isplacen</b> <b>prcing bar</b> <b>25 under</b> s $\delta_{V0}$ -factor $\delta_{V\infty}$ -factor in displacen	nent under s static, quasi-sta [mm/(kN)] [mm/(kN)]	Ø 8 atic and	Ø 10 seismid	Ø 12 c C1 act	tion					
$\begin{split} \delta_{N0} &= \delta_{N0} \text{-factor} \\ \delta_{N\infty} &= \delta_{N\infty} \text{-factor} \end{split}$ Table C16: D Anchor size reinfor For concrete C20/ All temperature anges	τ; τ; isplacen prcing bar 25 under s $δ_{Vo}$ -factor $δ_{V\infty}$ -factor ue displacen V;	nent under s static, quasi-sta [mm/(kN)] [mm/(kN)]	Ø 8 atic and 0,06	Ø 10 seismid 0,05	Ø 12 C1 act 0,05	t <b>ion</b> 0,04	0,04	0,04	0,03	0,03	0,0